Office-Based Sialendoscopy

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Key Points

1. Diagnostic office-based sialendoscopy is an option for cooperative adult patients with obstructive salivary symptoms of unknown etiology.
2. General anesthesia may be necessary for uncooperative patients, difficult anatomy, extensive disease, and/or need for invasive therapeutic intervention.

Introduction

Sialadenitis is the most common nonneoplastic disorder of the salivary glands [1]. Obstructive sialadenitis is the most common etiology with sialolithiasis being the most common underlying pathology (66%) in adults. Sialolithiasis affects the submandibular gland most commonly (80%) followed by the parotid gland (19%). Sialolithiasis of the sublingual gland and minor salivary glands is very unusual (1%). In children, the most common etiology of sialadenitis in the United States is juvenile recurrent parotitis, while the most common cause worldwide is paramyxovirus infection (mumps).

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Conservative management of sialadenitis includes nonsteroidal anti-inflammatory medications (NSAIDs) to decrease local inflammation, sialogogues to encourage salivary flow, and antibiotics to treat bacterial infection. In chronic or recurrent sialadenitis, the gland was thought to be minimally or nonfunctional as a result of fibrosis and chronic inflammation. In these cases, the gland was excised. It has however been shown that there is no correlation between the number of episodes or duration of symptoms and pathologic changes in the gland. In fact, half of glands excised for appropriate indications were normal on pathologic analysis [2].

Gland-preserving salivary gland surgery in the form of transoral sialolithotomy has been the standard of care for sialolithiasis of the distal ductal system for decades, but gland-preserving treatment of obstructive sialadenitis not due to sialolithiasis or distal stones has proven difficult. In the early 1990s, the first attempts at sialendoscopy by flexible endoscope was published by Katz [3] and Gundlach [4], and the first endoscopic retrieval of salivary stones was reported by Nahlieli et al. [5] using a TMJ arthroscope for both parotid and submandibular sialolithiasis. In the ensuing years, the indications for sialendoscopy have broadened significantly.

Applications of office-based sialendoscopy were realized early on in the history of the procedure. Both Gundlach and Katz reported performing the exam under local anesthesia [3, 4].

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As the options for intervention in sialendoscopy became more complex, more procedures were performed under general anesthesia. However, with proper experience and indications, we purport that the majority of cases of inflammatory salivary gland disease can be treated with office-based sialendoscopy.

The purpose of this chapter is to highlight the indications, contraindications, and limitations of office-based sialendoscopy. Specific consideration will be made to the importance of ultrasound for risk stratification, formulating a diagnostic plan, and aiding during office sialendoscopy.

Office-Based Sialendoscopy: Technique

Patient Tolerance

Perhaps the single most important prerequisite to successful office sialendoscopy is patient tolerance. This is influenced by a number of factors including physician rapport, patient comfort, local anesthesia, adequate anxiolysis when appropriate, and physician skill.

Before sialendoscopy the patient should be instructed to eat the morning of the procedure and should be well hydrated to avoid a vasovagal response during office sialendoscopy. In this preprocedural visit, it is also vital to build rapport with the patient to decrease preprocedural anxiety and increase patient tolerance to discomfort. During this visit the patient may also be prescribed anxiolysis as necessary. Given adequate preparation and explanation, the need for oral anxiolytic medications is rarely necessary.

The expertise of the proceduralist is also an important factor when considering office sialendoscopy. Data has shown that expertise scores increase and operative times decrease significantly after 10 and 30 cases of operative sialendoscopy. These performance measures continue to improve after 50 sialendoscopies [6]. Sialendoscopies are also more frequently successful in experienced hands. Aborted cases also decrease with experience, and more glands are preserved [7, 8].

Tools and Setup

The materials below are used by the senior author during most office sialendoscopy cases and may be modified as needed (Fig. 4.1):

Lidocaine 1% with epinephrine injectable on a 27 gauge needle.

Lidocaine 4% viscous gel.

Salivary guide wire (0.015 in.).

Salivary ductal dilators (4Fr, 5Fr, 6Fr).

Cheek retractor.

Lacrimal probes.

Conical dilator.

Smooth pickups.

Tenotomy scissors.

Sialendoscope set (0.8, 1.1, 1.3 mm).

Wire basket.

Endoscopic balloons.

Methylene blue (optional).

Vitamin C (optional).

The patient should be seated in a semi reclining position with the head supported. The cheek retractor is then gently inserted to enable adequate visualization of the oral cavity. The proceduralist may wear a headlight or use an external light source. All necessary supplies should be arranged in the order of use on a Mayo stand in easy reach of the proceduralist or the assistant.

The assistant should stand on the opposite side of the patient to the proceduralist. The monitor is placed on either side of the patient, and the light source is placed on the patient's left (Fig. 4.2).

Ultrasound

Ultrasonography is the radiologic exam of choice in salivary gland pathology. This is particularly true when evaluating a patient for sialendoscopy, as it enables the proceduralist to precisely locate the area and type of pathology.

Office ultrasonography has up to a 96% accuracy when detecting sialolithiasis [9]. This enables the surgeon to numerate, characterize,

Fig. 4.1 An image of the table setup for office-based sialendoscopy

Fig. 4.2 The procedure room arrangement for office-based sialendoscopy

and localize sialolithiasis. Mobile stones can be identified as such, and large, adherent stones can be triaged for fragmentation or sialendoscopy under general anesthesia. Ductal dilations associated with stenoses are easily seen on ultrasound, and dilation under direct visualization can be planned.

Visualizing the pathology associated with patient's symptoms also enables the surgeon to counsel the patients on the precise intervention planned, whether that be retrieval of a stone or ductal dilation.

Following sialendoscopy, treatment success can also be imaged with ultrasonography. Specifically, ultrasound can be immediately used to successfully identify retained stones in the case of transoral sialolothotomy, as during a combined approach, permitting re-exploration as necessary. Stenoses can be followed after ductal dilation, sialolithiasis can be surveilled, and gland parenchyma is easily imaged without invasive procedures.

Fig. 4.3 Left submandibular papilla after injection with lidocaine in preparation for dilation of the papilla

Papilla

The most frequent difficulty encountered in sialendoscopy, especially in the early stages of its utilization, is cannulation of the parotid or submandibular papilla. Even with experienced operators, difficulty is experienced in up to 15% of sialendoscopies [10]. This is particularly important in bedside sialendoscopy, as rapid intraductal access and expeditious intervention is vital to patient comfort and cooperation.

When identifying the Wharton's or the Stensen's duct, a submucosal 1% lidocaine injection can be invaluable. Submucosal lidocaine injection in the region of the papilla can also change the angulation of Wharton's duct, making the duct more vertically oriented and enabling more rapid cannulation (Fig. 4.3). Additionally, submucosal injection can make the region of the papilla firmer allowing for easier instrumentation of the region.

The papilla is then dilated with a conical dilator and can be cannulated with a 22G angiocath. Currently available guide wire and dilator systems, utilizing the Seldinger technique, may also be used to cannulate both the parotid and submandibular ductal systems. This enables an atraumatic identification of the duct. Once the ductal opening is identified, serial dilation can be performed. This minimizes trauma and maximizes efficiency of movement. The senior author rarely dilates to above a 6 Fr, as adequate access for most procedures can be obtained using a 5 Fr dilator.

Loupe or microscopic visualization of the duct is a simple, quick adjunct to papilla visualization. Without any added time and with the minimal addition of equipment, the papilla can be localized. This equipment is easily found in most otolaryngology offices. When needed, the author uses 2.5×–3.5× loupe magnification or the in-office microscope.

The first step in localizing the papilla, after direct visualization with or without magnification, is massaging the gland to express saliva. This is frequently successful, but the caruncle is sometimes hard to visualize given the translucent

Fig. 4.4 Painting the papilla with methylene blue can often assist in the identification of the ostium

appearance of the saliva and the reflective nature of well-hydrated mucosa. This is especially difficult in edematous ducts, angulated ducts, or in patients with xerostomia. In these difficult cases, methylene blue can be used to paint the region of the caruncle (Fig. 4.4). As the gland secretes even modest amounts of saliva, the dye will smear around the opening. A washout effect can eventually be seen, with a clearing of dye surrounding the papilla.

In individuals who produce little saliva with gland massage or those suffering from xerostomia, administration of vitamin C/citric acid orally can significantly augment salivary flow in the ductal system. Encouraging salivation is valuable in identifying the papilla and can aid in visualization of the ductal system of the parotid and submandibular glands during ultrasound examination [11].

Local Anesthesia

Local anesthesia is of particular importance in office sialendoscopy and aids in patient cooperation and comfort. The first step in local anesthesia is application of topical cetacaine spray to the mucosa surrounding the papilla. After allowing a few moments for the cetacaine to take effect, dilation of the duct is performed either using a tapered conical dilator or the salivary ductal dilator system. Once dilated to an adequate level, the dilator or the 22G angiocath is left in place and 4% viscous lidocaine is instilled through the lumen, and the glandular system left filled for several minutes to provide a sufficient “depth” of anesthesia.

If dilation of a stenotic segment or extraction of a large stone is planned, local injection can also be given percutaneously under ultrasound guidance. In these cases facility with ultrasound can be tremendously helpful to not only help localize the pathology transcutaneously, but also help with local anesthesia.

Sialolithiasis

Sialolithiasis is the most common etiology of sialadenitis and has a prevalence of 1/15,000–1/30,000 individuals per year [2]. Sialoliths are made of calcium carbonate and phosphate, with variable organic components. The exact sequence of events leading to sialolithiasis is unknown; however the suspected sequence of events is thought to involve intracellular calculi excreted into the ductal lumen which act as a nidus for stone formation [12]. Multiple sialoliths are common and occur in approximately 60% of the cases of parotid sialolithiasis and 30% of the cases of submandibular sialolithiasis.

Sialendoscopy is effective in both the diagnosis and treatment of sialolithiasis, and the indications for in-office sialendoscopic diagnosis and intervention in salivary stones are identical to those of operative sialendoscopy. Diagnostic sialendoscopy is a vital adjunct in the imaging of suspected sialolithiasis and when used in conjunction with ultrasonography can identify and endoscopically extract stones as large as 5–7 mm in both the parotid and submandibular ducts [2, 13, 14]). Contraindications to in-office sialendoscopic extraction of sialoliths include stones too large to extract only endoscopically (generally greater than 5 mm), patient intolerance to exam, and anatomic difficulties.

Ductal Stenosis

Ductal stenosis of the parotid duct, and less frequently the submandibular ducts, is an underrecognized cause of recurrent sialadenitis. Ductal stenoses have been found to cause 15–25% of sialadenitis without identified stones [15, 16]. Ductal stenoses are more frequent in the parotid duct (75%) than in the submandibular ductal system (25%) [15, 17].

Again, the indications of office-based sialendoscopy for ductal stenoses are identical to those of operative sialendoscopy. Office sialendoscopy is particularly useful in this patient population, as repeated dilations and surveillance of stenosis are frequently necessary. Contraindications to sialendoscopy under local anesthesia include Koch grade 4 narrowing (complete stenosis), as these frequently require percutaneous access of the proximal, dilated ductal system.

Diagnostic Staging

Several ductal stenosis classification systems have been described [15, 17, 18].

The Marchal classification system of stones classifies the sialoliths based on its size, mobility, and visibility within the duct (Table 4.1). This system seeks to stratify the stones based on ability to intervene endoscopically, as large, fixed, partially visualized stones are predicted to be the most difficult to extract endoscopically.

The Marchal classification of ductal stenoses groups stenoses based on both anatomic characteristics and amenability to particular interventions (Fig. 4.5). Diaphragmatic stenoses (S1) are easily dilated by any method and may be multiple. As their title suggests, these stenoses are thin and membranous. Stenoses of the main duct (S2) require more force to dilate and may require repeated dilations. Multiple, thick stenoses and diffuse ductal stenosis (S3, 4) are progressively more problematic to treat and very frequently require repeated interventions [17].

The Koch classification of stenoses is associated with increased recurrence, increased frequency of sialocele, and increased severity of symptoms in type II stenoses and fewest recurrences in type I or "inflammatory" stenosis (Table 4.2). Koch type III stenoses are associated with the greatest amount of luminal narrowing

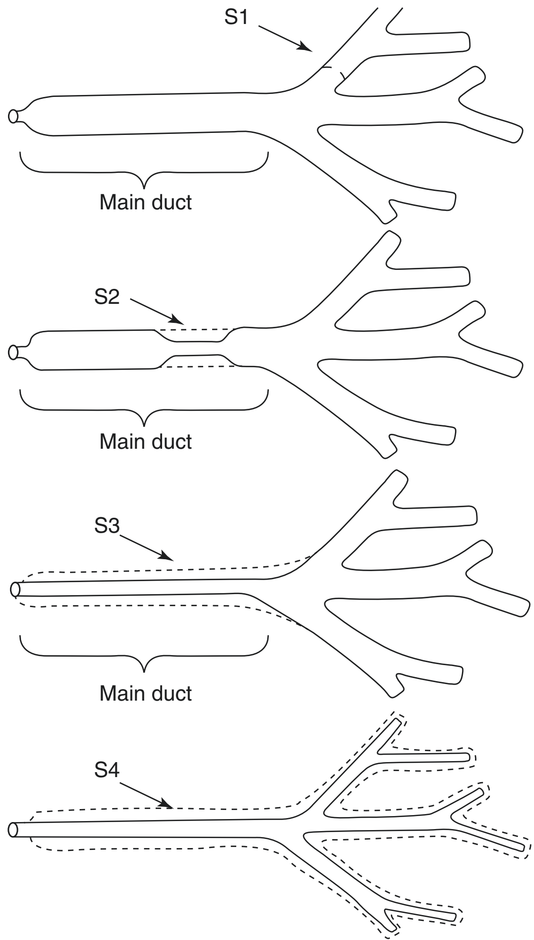

Fig. 4.5 Classification of extent of ductal stenosis (S) using the Marchal classification

Table 4.1 Description of salivary duct stones with the Marchal classification

Score		Findings
L0		Duct free of stones
L1		Floating stone
L2	a	Fixed, visible stone smaller than 8 mm
	b	Fixed, visible stone larger than 8 mm
L3	a	Fixed, partially visualized stone, palpable
	b	Fixed, partially visualized stone, nonpalpable

Table 4.2 Description of ductal stenosis using the Koch classification scheme

Grade	Description
1	Passable with 1.1 mm endoscope
2	Passable with .8 mm endoscope
3	Not passable with .8 mm endoscope
4	No visible lumen
Type	**Description**
1	Inflammatory
2	Fibrous webbed
3	Fibrous circumferential

Koch et al. [18]

and highest rates of recurrence. Regardless of stenosis type, over 30% of stenotic ducts may require repeat sialendoscopy [18].

RAI Sialadenitis

Radioiodine-induced sialadenitis is the most common sequela of radioiodine administration for malignant thyroid disease and can lead to chronic xerostomia, mucoid saliva, and ductal strictures. RAI-inducted sialadenitis occurs in approximately 20% of patients, more frequently in the parotid ductal system (90%). RAI-induced sialadenitis is caused by the concentration of I131 in the striated ducts of the salivary glands by the ATP-dependent Na/I cotransporter, causing damage to the surrounding duct and acinar cells [19]. The damage caused by I131 is dose dependent, with more severe symptoms and increased frequency of RAI-induced sialadenitis with higher doses of I131. There are two peaks in the incidence of RAI-induced sialadenitis [20]. The early form of RAI-induced sialadenitis develops in the first 48 h after treatment, is bilateral, and resolves with conservative treatment in 10–14 days. The second "late" peak in RAI-induced sialadenitis occurs 3–6 months following treatment and is obstructive in nature [21]. This "late" RAI-induced sialadenitis is characterized by plaque formation, strictures, mucoid saliva, mucus plugging, and recurrence. The traditional treatment of RAI-induced sialadenitis has been conservative with NSAIDS, steroids, pilocarpine, sialogogues, and gland massage. Recently, however, sialendoscopy has been increasingly used to dilate stenoses and irrigate affected glands.

Sialendoscopy is a valuable treatment modality in RAI-induced sialadenitis, and indications for office-based sialendoscopic intervention remain identical to operative sialendoscopy. Literature has shown that RAI-induced sialadenitis improves significantly in both subjective and objective measures following sialendoscopy [19, 22]. The clinician has the ability to both diagnose and treat each pathology associated with RAI-induced sialadenitis. Affected glands are irrigated with intraductal steroids, mucus plugs are dislodged and flushed, and stenoses can be dilated. Patients with recurrent symptoms, although rare, can be treated with repeated dilations of strictures, steroid, and/or antibiotic irrigation.

Sjogren's Syndrome

Sjogren's syndrome is a progressive autoimmune disease characterized by chronic inflammation and damage to the exocrine glands. Sjogren's syndrome affects all mucosal surfaces, most commonly resulting in xerostomia and xerophthalmia. Four of six positive diagnostic signs are required for diagnosis of Sjogren's syndrome, including biopsy of the minor salivary glands, xerostomia, xerophthalmia, decreased lacrimal gland function, decreased salivary function, and the presence of anti-SSA and anti-SSB antibodies. The parotid gland is the most commonly enlarged gland, while the submandibular gland is sometimes involved. Discomfort and xerostomia in Sjogren's syndrome are caused by chronically decreased salivary gland output due to ductal debris, thickened saliva, and ductal stenosis with subsequent retrograde bacterial infection [19, 23].

Conservative treatment of xerostomia, swelling, and pain associated with Sjogren's syndrome is first done with "palliative" agents such as artificial saliva, secretagogues, and disease-modifying drugs like steroids and sex hormones. With acute bacterial infection, antibiotics and glandular massage attempt to remove ductal debris. The role of sialendoscopy in Sjogren's syndrome is to delay or prevent parenchymal loss by removing ductal debris, dilate stenosis, and irrigate with steroids. Subjective symptoms are improved after sialendoscopy; however no objective improvement in salivary flow has been shown. The most frequent findings on sialendoscopy in Sjogren's syndrome are thick, mucoid saliva, obstructing ductal debris, and ductal stenoses [23]. Repeat sialendoscopies are frequently necessary, as Sjogren's syndrome is a progressive disease. Office sialendoscopy is an important intervention in Sjogren's, as it allows preservation of salivary flow without the additional burden of general anesthesia.

Juvenile Recurrent Parotitis

Juvenile recurrent parotitis is the most common inflammatory disorder of the salivary glands in children in the United States and the second most common inflammatory disorder of the salivary glands worldwide to mumps [24, 25]. Juvenile recurrent parotitis features nonobstructive, nonsuppurative, recurrent parotitis. The peak age of onset is typically between 3 and 6 years, and recurrent episodes can continue until puberty. The traditional treatment regimen of JRP has included NSAIDS, antibiotics, sialogogues, and warm compresses. This regimen, while effective on acute episodes, does nothing to decrease recurrence of symptoms [24]. The characteristic sialendoscopic findings in juvenile recurrent parotitis include whitish ductal walls without vasculature, less frequent fibrinous debris. Sialendoscopy with steroid and/or antibiotic irrigation has recently been shown to be effective in decreasing recurrence [24, 25].

The pediatric population poses unique challenges for office-based sialendoscopy, as patient tolerance and cannulation of the pediatric papilla are of paramount importance. Literature has shown there is no clinically significant difference in the size of the pediatric papilla or duct [25]. To further aid in rapid cannulation of the duct, the characteristic appearance of the papilla in juvenile recurrent parotitis is widely patent [26]. In appropriately selected children over 8 years old, office sialendoscopy with irrigation and dilation is an excellent option to decrease recurrence in JRP and avoid the risks of general anesthesia.

Contraindications

While office sialendoscopy is an excellent diagnostic and treatment modality in salivary gland diseases, there are certain specific contraindications to its use. The primary impediment to office sialendoscopy is inability to access the duct. Multiple factors may contribute to difficulty in access.

Severe trismus is a significant obstacle in office sialendoscopy, particularly when attempting to cannulate Wharton's duct. When range of motion is limited by pain, the patient may be premedicated with oral analgesics to increase mouth opening. When conservative measures are insufficient, however, general anesthesia may be necessary to aid in visualization and cannulation of the duct. In most cases under general anesthesia, sufficient exposure can be obtained with paralytic medication and self-retaining retractors to permit access to the submandibular ductal system.

Difficult oral anatomy is an important but less common contraindication to office sialendoscopy. Acute angulation of Wharton's duct, as can be seen in the case of mandibular tori, can prohibit rapid and comfortable cannulation of the submandibular duct, necessitating the more controlled environment of the operating room (Fig. 4.6).

Mandibular tori may also crowd the floor of the mouth, making access to Wharton's duct difficult or angulating the ducts so that passage of a semi-rigid endoscope is impossible. In some cases, these tori may need to be excised under general anesthesia in order to permit access. In the senior author's experience, office sialendoscopy can be attempted and, if not possible, can be rescheduled for the operating room.

Acute infection is the only strict contraindication common to both operative and office sialen-

Fig. 4.6 The presence of mandibular tori may result in unsuccessful cannulation of Wharton's duct

doscopy. Edema surrounding the ductal papilla significantly increases difficulty in cannulation, inflammation of the papilla and duct decreases the efficacy of local anesthesia, and regional inflammation narrows the ductal lumen to increase the risk of ductal injury and decrease the utility of sialendoscopy. Additionally, acute inflammation can make the wall of the ductal system more friable, which could lead to perforation of the duct.

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